SHOUT
SHARE
IT

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 469

Contribution from the States Relations Service
A. C. TRUE, Director

Washington, D. C. PROFESSIONAL PAPER December 15, 1916

FATS AND THEIR ECONOMICAL USE IN THE HOME.[1]

By A. D. HOLMES and H. L. LANG, *Scientific Assistants, Office of Home Economics.*

CONTENTS.

	Page.		Page.
Introduction	1	Economy in the use of fats	17
General nature of fats	2	Utilization of waste fats	20
The place of fats in the diet	3	Rendering and clarifying fats	22
Digestibility of fats	4	Savory fats	23
Sources and kinds of edible fats	6	Softening hard fats to make them more satisfactory for shortening purposes	24
Animal fats	8	Care and storage of fats in the home	25
Vegetable fats	12	Summary	26
The selection of edible fats	15		

INTRODUCTION.

The fats in the ordinary diet fall naturally into two groups, those eaten because they happen to be components of foods, like the fat in milk, meats, or fish, and those like butter, salad oils, or lard, which are added to other foods in cooking or serving. The housekeeper interested in the economical use of fats in the home must take into consideration fat as contributed by both groups. Obviously, the kind and quantity of the first group of fats eaten are determined by the foods making up the diet, and this is governed largely by individual tastes and local or family food habits. As regards this group, economy involves chiefly the proper selection and combination of foods containing fat in abundance with other foods containing little of it, so as to secure a diet supplying the proper proportions of protein and carbohydrate as well as fat. As this matter

[1] Prepared under the direction of C. F. Langworthy, Chief, Office of Home Economics.

NOTE.—This bulletin contains information regarding the character, selection, and use of edible fats in the home, much of the material being based on investigations made in the laboratory of the Office of Home Economics of the States Relations Service. It is of interest to teachers and students of domestic science, housekeepers, and others concerned with the problems of food selection and preparation.

61287°—Bull. 469—16——1

of the nature and use of foods (some rich in fat) has been considered in other bulletins of this series, the present publication is concerned chiefly with the second group, or the added fats. For convenience the added fats may be subdivided into table and culinary fats. Table fats are those like butter and table oils, which are most commonly used as an accompaniment to food to secure a desired flavor or texture, and culinary or cooking fats are those which are incorporated with other foods (as shortening) or used as a medium for cooking foods, as in frying. Economy in the use of the added fats involves the intelligent selection of the different kinds, so as to secure the sort best adapted for a particular purpose, and the careful use in the home of the fats selected. It is the purpose of this publication to consider briefly the nature of fats, their value in the diet, and their digestibility; to describe the great variety of table and culinary fats on the market; and finally, to consider the economical selection and use of fats in the home. It is believed that such knowledge will prove helpful in buying and using fats to the best advantage.

GENERAL NATURE OF FATS.

The appearance and physical properties of the common fats and oils used for food purposes are too well known to require much description here. Chemically considered, fats consist chiefly of glycerids of fatty acids. The fatty acids whose glycerids are most common in edible fats are oleic, linolic, palmitic, and stearic. One fat differs from another primarily in the proportions of these esters which it contains and in the presence or absence of small quantities of other substances, such as free fatty acids and characteristic flavoring and coloring bodies.

The melting point or hardness of any fat depends on the relative proportions of these acids present, and fats containing large amounts of combined oleic and linolic acids are soft or liquid, while those containing large amounts of palmitic or stearic acid are solid. This follows whether the respective acids are combined as triglycerids or as mixed glycerids.

The color of some of the crude fats and oils varies from light yellow to red, or even black, but the refining processes remove a great proportion of the color-giving bodies, and the pure fats and oils are a pale yellow or colorless when liquid, and white or creamy white when solid.

The flavors and odors of fats are probably due to the presence in them of small amounts of difficultly removable substances rather than to specific properties of the pure fats themselves, in view of the fact that flavors and odors become much less noticeable the more completely the fats are purified. The characteristic flavor of butter, for example, is due to the absorption by the fat of the substances

formed in the fermentation of milk and cream by lactic acid and bacteria and to the presence of small particles of the curd. Similarly, the by-products, such as butyric acid, which are formed by the action of undesirable bacteria, may be absorbed by the fat and give rise to the undesirable flavor of butter of poor quality or that which has deteriorated. Musty flavors are doubtless due to the presence of the products of metabolism of molds which may be present in the fats. In the case of some fats, like those of beef and mutton, or the fish oils, it has apparently been impossible to remove entirely the flavor-giving substances by the ordinary methods of refining.

The exact nature of the compounds causing the rancid taste and odor of fats is not known. It is believed by some investigators that free and unsaturated fatty acids are first formed by the hydrolysis of the fats and that in the presence of light and air these fatty acids are oxidized to odoriferous compounds (aldehydes, ketones, etc.), the presence of which is thought to be identical with rancidity.

Very little is known of the nature of the combinations formed when culinary fats and other food materials are mingled in doughs, batters, etc. It is not definitely known to what extent these are mechanical mixtures and to what extent the ingredients have undergone chemical and physical changes. It is probable that the texture, and consequently the thoroughness of digestion of the finished bread or cake, depend in some degree upon such factors, and more information on this subject is desirable in order that the culinary processes may be more completely understood and controlled.

THE PLACE OF FATS IN THE DIET.

The chief value of fats in nutrition is that they furnish energy which the body requires to perform its work. The ideal diet should contain sufficient quantities of fat and carbohydrates to insure it the required amount of energy, as well as a sufficient quantity of protein to supply the necessary nitrogen for growth and repair of the body, also mineral matter for growth and other body needs, and vitamins or similar bodies required to render the diet adequate for maintenance. Since fats furnish $2\frac{1}{4}$ times as much energy, pound for pound, as do proteins and carbohydrates (1 pound of fat furnishing about 4,000 calories, and 1 pound of protein or carbohydrate only about 1,800 calories), and since they are both wholesome and palatable, they are very commonly used to increase the energy value of the diet. Furthermore, they are especially useful as a source of energy where an excess of carbohydrates in the diet is to be avoided, as in cases of diabetes or certain forms of indigestion.

The consumption of some fat is apparently universal, although the amount eaten varies within rather wide limits. The diet in the polar regions represents one extreme, fat being used in quantity with

meat, which is the chief article of diet. Though it seems to be less well known, it is nevertheless true, that fats are also eaten in considerable quantity in tropical countries, as is evident when one recalls the coconut oil of the South Sea Islands and the olive oil and other fats so much used in cookery in other regions characterized by a very warm climate. As everyone knows, dwellers in temperate regions use fat in the diet in many ways, which are determined largely by the prevailing food habits and the kinds of fat procurable, and in quantities which bear a more or less direct relation to the amount of physical work performed. Men engaged in severe work out-of-doors often eat large quantities of fatty foods. Workmen in lumber camps, for instance, relish a diet of pork and beans and other fat foods which would be too hearty for the office worker or clerk. It is difficult to obtain any definite figures for the quantity of fat eaten by the average person, but in 1,300 dietary studies of families, carried out among different races and in different countries, it was found that the average quantity of fat eaten was about 4½ ounces per person per day, the variation recorded being from 1½ to 13 ounces per person per day.

While fats and carbohydrates may replace each other to a considerable extent, recent investigations indicate that some carbohydrate supplied by the food or formed in the body from protein is essential for the combustion of fats in the body. Experts in nutrition and dietetics, therefore, believe that neither one should be used to the exclusion of the other.

DIGESTIBILITY OF FATS.

While all fats yield approximately equal amounts of energy when burned outside of the body, the energy which the body actually derives from each is dependent upon its digestibility; that is, the proportion which the body retains. The digestibility of a number of the individual fats[1] has been determined, and the information at present available indicates that fats in general are very thoroughly digested; more so, indeed, than the animal or vegetable proteins and the starch occurring in the ordinary mixed diet. Such slight differences as have been observed in the digestibility of individual fats evidently correspond to differences in their melting points. Available evidence indicates that fats such as mutton fat, having a melting point higher than the body temperature, are less completely assimilated than those melting at a lower temperature, such as lard, butter, olive oil, and cottonseed oil. Also, it has been shown by feeding experiments with laboratory animals that animal and vegetable stearins (melting above body temperature) are only

[1] U. S. Dept. Agr. Bul. 310 (1915).

very slightly assimilated by the body when eaten alone, whereas, if mixed with palmitin and olein digestibility is increased because, no doubt, the mixture has a lower melting point than the stearin by itself.

The digestive disturbances often attributed to eating fat are probably due not so much to the inability of the body to digest the fat itself as to other factors, chief among which are bad cooking, overeating of foods containing fats, and rancidity. Laboratory experiments have shown that under some conditions, when fats are overheated, a chemical compound called acrolein is formed. This substance is especially irritating to the mucous membranes of the eyes, nose, and throat, and it is well known to housekeepers that when fats are scorched vapors are given off which cause the eyes to water. If any of these vapors were occluded in the food during frying it seems probable that similar irritation would be produced on the delicate mucous membrane of the digestive tract. Obviously, such digestive disturbances can not be cited as proofs of an incomplete digestion of fats.

Disagreeable sensations are experienced by some people after eating large quantities of foods such as meats containing much fat interspersed with the muscular tissue, and overrich puddings or salads. This may be explained by the fact that the digestive juices of the stomach have little solvent action on such nonemulsified fats and are thus hindered from digesting the protein which is covered by or very intimately mixed with the fat. The passing of the food through the pylorus into the small intestine is thus delayed until the fat has become separated from the lean portions by the enzymic and mechanical action of the stomach. For this reason very fat meats, for instance, remain a longer time in the stomach than lean meats, although in the end they are as thoroughly digested. Similar digestive disturbances are sometimes experienced after eating fried foods (cooked without scorching) or foods in which fat is incorporated in such a manner that it prevents the digestive juices from acting upon the protein and carbohydrates. This delayed digestion is often mistaken for diminished or incomplete digestion. Fats which have become rancid, even though the rancidity is not sufficiently marked to influence the flavor very much, may cause digestive disturbances in some people. That this is not always the case is evidenced by the fact that there are some oriental people who eat rancid butter or oils apparently by preference.

It must be remembered that there are some persons whose systems can tolerate little if any food rich in fats. This, like the inability of some to eat strawberries, onions, or other foods, without digestive disturbances, is a matter of individual peculiarity.

SOURCES AND KINDS OF EDIBLE FATS.

The fats eaten in the ordinary mixed diet are furnished chiefly by such foods as fat meats, butter, milk, and cream, but are also present in smaller amounts in pastry, breads, eggs, cheese, cereals, etc. Fat meats like pork (including lard) and beef furnish about 59 per cent of the total fat in the average American diet, ac-

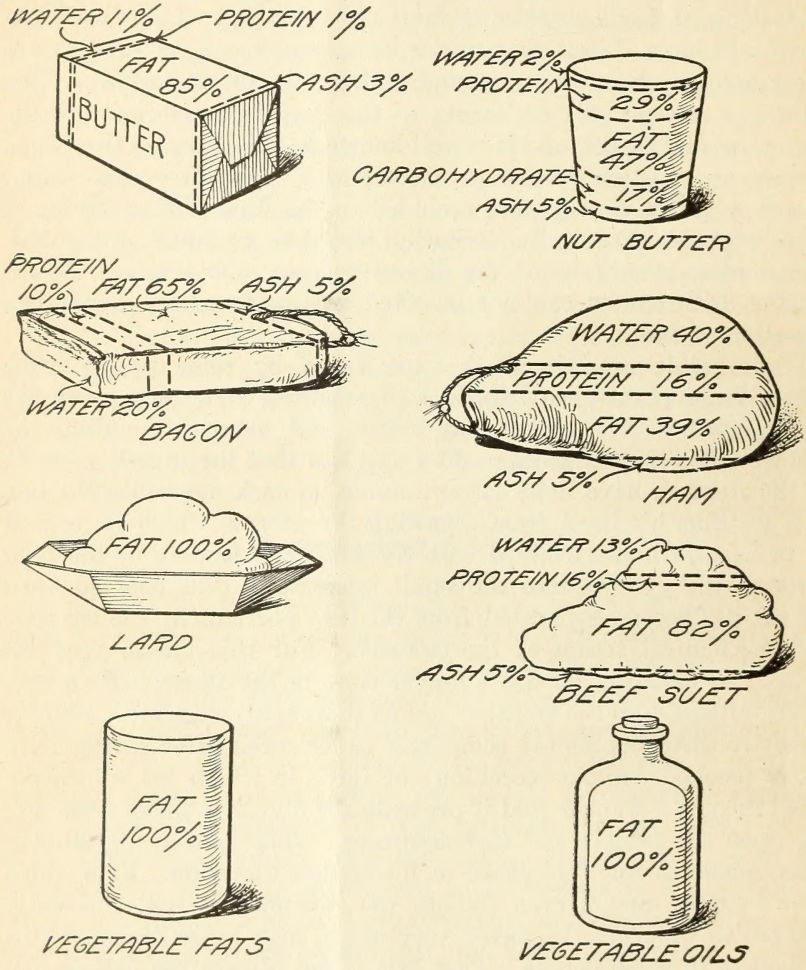

FIG. 1.—Composition of some common fatty foods.

cording to the results of about 400 studies as reported in an earlier publication of this office.[1] The same investigations showed that dairy products, including butter, milk, cream, and cheese, furnish about 26 per cent of the total fat; cereal products, including

[1] U. S. Dept. Agr., Office Expt. Stas. Circ. 110 (1911).

cakes and breads, about 9 per cent; eggs about 3 per cent; and fish about 1 per cent. Some kinds of fish contain considerable fat and offer a means of adding it to the diet. One-tenth of the edible portion of such fish as the catfish, salmon, butterfish, trout, shad, and a smaller proportion of other common fish consists of fat. The composition of some of the foods which are important sources of fat in the diet is shown in figure 1. The amount of energy supplied by these foods depends on the quantity of fat which they contain, the pure fats like lard or vegetable fats furnishing 4,080 calories per

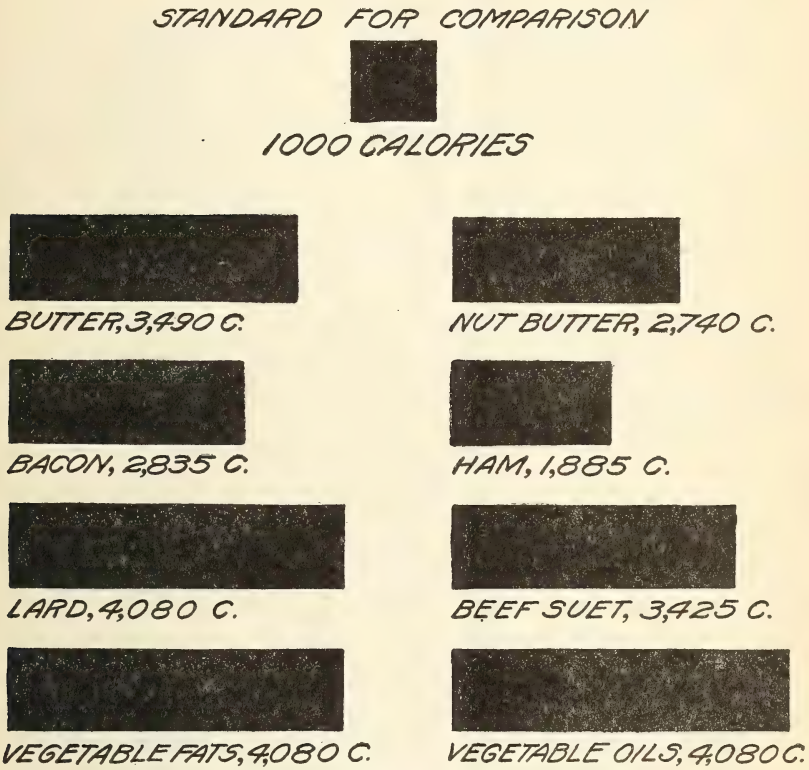

FIG. 2.—Energy furnished by one pound of common fatty foods.

pound, and those containing other ingredients like water or protein naturally having a lower energy value. For comparison the energy furnished by 1 pound of some of the common fatty foods is shown graphically in figure 2.

Not many years ago the fats used in this country were obtained almost entirely from the two groups of farm animals, cattle and hogs. Butter and cream were the ordinary table fats, and it was the general custom for each family to obtain its own supply of lard, which was the chief cooking fat, from the pigs slaughtered

on the farm. Beef and mutton fats, or tallows, as they were generally known, were used in cooking to some extent in the form of "dripping" obtained from cooking meats, but found a much wider use for candle and soap making. Chicken fat was also used in a limited way. As the population began to concentrate in cities and towns, the introduction of central slaughterhouses and rendering plants made it possible to obtain both meat and fat separately in such ways as met individual requirements, and home rendering of fats quite generally disappeared except in rural regions. The increasing population created a demand which soon exceeded the available supply obtained from slaughtered animals, and this made it necessary to seek additional sources of edible fats. Naturally, olive oil, used for food purposes in some parts of Europe and the Orient and less generally in the United States, suggested the possibility of the utilization of other vegetable fats, and as the methods of refining were improved cottonseed oil came to be very commonly used, and, to a less extent, coconut, peanut, and corn oils. At the present time there are also a number of vegetable fats on the market, some of which are simply refined and used alone or in admixture, while others have been treated by special processes designed to render them harder or otherwise changed in character. In the following pages general information is given regarding the nature, source, and use of some of the more important edible fats.

ANIMAL FATS.

BUTTER.

Butter is the most popular and widely used of all fats in the United States, it being estimated that from 17 to 18 pounds per capita are consumed yearly, most of it for table purposes. Its food value is due largely to the energy it furnishes, which is about 3,500 calories per pound. It consists of the fat of milk, some water, and a little curd and added salt. Butter is of two kinds, salted and unsalted. Commercial butter contains approximately 82.5 per cent of fat, which consists chiefly of palmitin and olein with small amounts of myristin, butyrin, and other glycerids of the fatty acids. The color varies considerably with the nature of the food materials eaten by the cow; the yellow is deeper in summer when green food is eaten. It is a common practice to add vegetable coloring matter, especially during the winter months, to intensify the natural color. Since butter tends to deteriorate easily, care in its manufacture is necessary to secure a wholesome product with good keeping qualities. The milk from which the cream is separated should be free from disease-causing bacteria as well as from microorganisms which would produce undesirable flavors or odors in the butter. For this reason

in many creameries the milk or cream is pasteurized to kill undesirable organisms, and the ripening of the cream is started and controlled by the addition of a pure culture of bacteria which produce the desired flavors. Care must also be taken in the handling and storage of butter to prevent it from becoming contaminated with disease-causing bacteria or from absorbing undesirable odors or flavors. Such precautions, necessary to secure a wholesome product, naturally add to the cost of butter, but obviously from the standpoint of health are well worth the higher price. Butter of inferior quality is frequently treated by a commercial process which removes the objectionable odor and taste and then marketed as renovated or "process" butter. As many housekeepers know, strong butter can be made more palatable by washing it repeatedly in clean, cold water and then resalting; if the final washing is done in milk a better flavor is obtained. The commercial process of renovating butter is somewhat similar to this domestic process. The butter is melted, and air is blown through it until the undesirable flavor due to volatile substances is carried away. The product is then emulsified with soured milk and worked like ordinary butter. Renovated butter sells for a lower price than fresh butter, and for this reason it is used quite extensively in cookery, and to some extent for table purposes. If the process is carefully carried out it is of good flavor. Naturally, the sale of renovated butter as fresh butter is prohibited by the Federal and State pure-food laws.

Rendered butter, called "ghee" in India, is preferred by some people to ordinary butter. It is easily prepared by melting the butter with or without adding water and allowing the mixture to become cold, when the layer of butter fat is removed; if desired, salt is added to replace that removed in rendering.

CREAM.

Cream, which contains from 18 to 40 per cent of fat, should be regarded as one of the available fats. It is generally used as a table fat, being served with cereals and fruits, as a constituent of ice cream, and plain or whipped with jellies or puddings. In rural regions, where the supply is large, both sweet and sour cream are commonly used for shortening, but to a less extent in cities and towns, where cream is more expensive. Cream is very palatable to most persons, and for this reason it is often prescribed by physicians for people who require a diet rich in fats. A form of cream more common in England than here, and known as "Devonshire Clotted Cream," is prepared by heating to about 180° F. whole milk on which the cream has been allowed to rise, cooling the mass, and skimming off the cream. It has a light-yellow color and a character-

istic nutty flavor, is much thicker than ordinary cream, and contains about 60 per cent of fat.

LARD.

Pork fat is one of the more widely used of the animal fats, being eaten in a variety of forms, such as bacon, ham, fresh and cured pork, and lard, which is used principally for culinary purposes. The best grade of lard, commonly known as leaf lard, is rendered from the fat which surrounds the kidneys of the animal, but commercial lard is often rendered from any or all of the fatty portions of the animal and could be more exactly termed pork fat. Since lard contains a relatively small amount of the harder constituents of fats, it has a moderately low melting point and so is easily handled in the preparation of doughs. This is a reason why some housekeepers prefer it to harder fats for shortening purposes, especially in cold weather. For some special shortening purposes lard may be too soft and require hardening by chilling before use. Pure lard should be white in color and practically free from taste or smell. Home-rendered lard may contain varying amounts of water, according to the mode of rendering, but that containing the smallest quantity has the best keeping qualities; the commercial product contains practically no water. Formerly lard was sometimes adulterated by the addition of different substances, but with more stringent regulations this has practically ceased, and the commercial product is generally wholesome and prepared under sanitary conditions from animals which have been inspected before slaughter.

BEEF FAT.

Beef fat contains a large amount of stearin and is therefore harder than either butter or lard. The hardness and other characteristics of beef fat, as well as other animal fats, vary somewhat according to the part of the body from which they are obtained; for example, brisket fat, from the breast of the animal, is softer than rendered suet, the fat surrounding the kidney. The hardness of beef fat, and its rather pronounced flavor, which is unpleasant to some people, have doubtless prevented its more extensive use for culinary purposes. Many attempts have been made to remove the flavor, but apparently no method has been discovered which gives results satisfactory enough to warrant its use on a commercial scale. Finely chopped unrendered suet is quite often used for shortening in such dishes as suet puddings. Rendered beef fat, or tallow, as it is sometimes called, is used by many people for shortening purposes, being mixed with butter or some other fat to soften it. It is sometimes sold in the market for this purpose, and in many homes beef suet or small scraps of fat trimmed from roasts, etc., are rendered for use in shortening and

frying. Rendered beef suet has no general use in this country as a table fat, but in Europe people with small incomes often eat so-called drippings on their bread in place of butter. These drippings are sometimes obtained from roasting or broiling beef, but in many cases are simply rendered suet.

MUTTON FAT.

Mutton fat, called also mutton tallow or suet, contains a relatively large amount of stearin and is, therefore, classed commercially as a hard fat. It is used in the manufacture of stearin for soap making, and small quantities of the more highly refined grades are used in the manufacture of toilet creams and other cosmetics. Edible mutton fat is now prepared in considerable quantities, the mutton tallow and mutton stearin being used as ingredients of lard substitutes and the mutton oil as an ingredient of the lower grades of oleomargarine. Mutton fat is eaten to some extent in most homes as a constituent of fat mutton or lamb and in gravies served with such meats. Mixed with softer fats it is occasionally used in the home for shortening and frying, but much less so than pork and beef fats. This, no doubt, has been due to the characteristic mutton flavor, which is unpleasant to many people, to the hardness of the fat, and in some degree to the smaller available supply.

POULTRY FATS.

Poultry fats resemble butter and lard in consistency, and recent investigations show them to be as thoroughly digested as other fats of the same degree of hardness. That they are wholesome and palatable is indicated by the fact that they are very frequently eaten as a constituent of gravies, broths, and soups. Many housekeepers consider poultry fat very useful and desirable in cookery, but the total quantity of poultry fats used in this manner is relatively small, owing to the limited supply. In the household small quantities are obtained in dressing and cooking fat poultry, but the only available commercial supply is that obtained from very fat birds drawn at the market for those who do not desire the excess fat. Chicken fat is the poultry fat most used for cooking purposes in the United States, as is natural, since chickens are the commonest table poultry. Goose fat, so well known in Europe, is used in this country chiefly by families of foreign birth or descent who keep to old food customs.

OLEOMARGARINE.

A discussion of animal fats would not be complete without some mention of oleomargarine, called "margarin" in Europe. The term margarin was at first used to designate a mixture of fats, composed of such proportions of palmitin and stearin that it closely resembled

margaric acid, for which it was often mistaken, and so it was given the name "margarin." Later, when soft beef fat, or oleo oil, became an important component of this mixture, it was called oleomargarine or oleo. The name does not at present, however, indicate the composition of the oleomargarine. The principal fats used in its manufacture in the United States are oleo oil, neutral lard (that is, a specially rendered lard), and cottonseed and other oils. All these ingredients must be pure and prepared with care in order that none of them shall have any marked taste or odor. These are mixed in such proportions as will give the final product a melting point very near that of butter. After being thoroughly mixed the fats are churned with a small quantity of milk and sometimes cream, the proportions of these used depending upon the quality of the product desired. In the preparation of high-grade oleomargarine varying quantities of butter are also added. The resulting product is then washed, salted, and worked as in ordinary butter-making processes. Owing to the ease with which a highly colored oleomargarine might be sold as butter, it is illegal to sell oleomargarine unless it is plainly labeled as such, and the practice of coloring it to imitate butter is discouraged by a heavy tax. Oleomargarine is not used as extensively in this country as in Europe, where it serves both for table and culinary purposes. If prepared from pure materials and under sanitary conditions, it is a wholesome fat, which, according to European investigators, is well assimilated. It has an energy value of about 3,500 calories per pound.

VEGETABLE FATS.

Vegetable fats are prepared on a commercial scale from oil-bearing seeds and fruits and must ordinarily be freed from disagreeable flavors and odors as well as from dirt, by-products, and harmful constituents. In general, the process involves cleaning the seeds or fruits and subjecting them to hydraulic pressure. Cold-pressed oils usually receive no further treatment. When the seeds or oily pulp are hot pressed, however, the raw oil is likely to contain free fatty acids and other organic compounds of a disagreeable nature which make refining necessary. The refining process is adapted to the properties of the oil in question.

OLIVE OIL.

Olive oil is obtained by subjecting the ripe olives to pressure. The best grade, known as virgin oil, is obtained from perfect olives of the proper degree of ripeness. Lower grades may be obtained either by crushing and pressing an inferior quality of olives or by a second pressing of the residue from the first pressing of the better grades of fruit. The only refining or purification of the better

grades of oil necessary is filtration to remove foreign matter. In the United States olive oil is used almost exclusively for table purposes, being a very common salad oil. In localities where it is produced, especially in southern Europe, it is used for cooking as well as for table purposes, owing to the larger and more readily available supply (especially of the cheaper grades) and to the relatively limited supply of animal fat in such regions.

COTTONSEED OIL.

Cottonseed oil in its crude form is obtained as a ruby or dark-red oil by subjecting the seeds of the cotton plant to great pressure. This crude oil was at first used for soap making and other industrial purposes, but with the increased demand for culinary fats improved methods of refining the crude oil, such as treating it with caustic alkali, fuller's earth, distillation with steam, etc., were developed. These serve to modify greatly the color, odor, and taste, and the best grade of table oil has a light-yellow color and a bland flavor. The refined oil was first utilized in the preparation of various lard substitutes by mixing with it hard animal fats to produce a substance having a consistency similar to lard. Other methods have been developed, and a wide variety of cooking fats prepared from cottonseed oil are now on the market. More recently salad oils have been prepared which are wholesome and palatable and are being used in increasing quantities for table purposes.

PEANUT OIL.

Peanut oil is not used to any extent for culinary purposes in this country, but some is imported for use as a salad oil. In Europe, where it is obtainable in relatively large quantities, it is used quite extensively both as a table oil and for cooking. When prepared by the cold-press method the characteristic peanut flavor is not noticeable and the product is bland and palatable. In the past the peanut oil produced in this country has been used in the crude state for industrial purposes, but an attempt is being made to develop the peanut-oil industry in this country and to encourage the more extensive use of the refined oil, which is now more expensive than cottonseed oil, but less expensive than olive oil of similar grade.

COCONUT OIL.

Coconut oil is prepared by pressing the dried meat of the coconut, which is known in the trade as copra. The crude oil is used for cooking purposes in tropical countries where the oil is prepared. In this condition the fat melts at about 70° F. and is a liquid in summer or in warm rooms during the winter. Refined coconut fat has little marked taste or odor if fresh and carefully prepared, and when solid

is white in color. It has only recently come into use for culinary purposes but bids fair to become an important cooking fat. There are a number of coconut-oil products on the market, but these are not much used for home cooking. They are extensively used in bakeries and similar establishments, one reason being that they can be obtained with a considerable range of hardness, so that they are useful for many special purposes. For instance, one of the coconut fats is combined with sugar for use as a filling for some sweet crackers.

CORN OIL.

Corn oil is prepared from the germ of the corn which is obtained as a by-product in the manufacture of cornstarch and glucose. The germs are ground and subjected to pressure which removes the oil. Some studies have been made of the use of corn oil for shortening purposes. Pastry made with mixtures of lard and corn oil in amounts not exceeding 10 per cent of the latter gave results identical with those in which lard alone was used.[1] When properly refined, corn oil is a wholesome product and is marketed to some extent as a table oil. Large quantities of the crude oil are used for industrial purposes.

MISCELLANEOUS OILS.

In addition to the above-mentioned vegetable oils there are a number of others, such as soy bean, sunflower, sesame, and colza or rapeseed oils, which may be mentioned here. When carefully prepared these oils are of a yellow color and bland flavor and are used for food purposes in those countries where the particular seeds are obtainable in large quantities and the supply of other edible oils is limited. Walnut and similar nut oils, produced in some countries where the nut crops are large, are of good flavor and find a use for salad purposes.

There is some attempt being made to promote the utilization for table purposes of oils expressed from the kernels of the stones of such fruits as the apricot, peach, and cherry. Inasmuch as these stones are available in quantity as a waste product of the drying and canning of fruits, and the expression and refining of the oil may be done at small cost, they offer an additional source of edible oil.

HARDENED VEGETABLE FATS.

Hardened vegetable oils, technically known as hydrogenated oils, which have much the same consistency as lard or butter, have been put on the market within recent years. They are commercial pos-

[1] Ann. Rpt. Ohio Dairy and Food Comr., 21 (1906), pp. 18–23.

sibilities owing to the fact that as a result of a long series of laboratory experiments processes have been discovered by which oils may be transformed into a product of any desired hardness by chemically adding hydrogen to them. This reaction takes place, for instance, when finely divided nickel, hydrogen, and the oil to be hardened are intimately mixed under proper conditions. The nickel does not enter into the composition of the hardened fat, but is removed and used repeatedly in the preparation of other batches. The hardened oils are generally white in color, have no appreciable odor or taste, and are less likely to become rancid than the original oil. A number of these fats, marketed under a variety of trade names, have proved popular and appear to be of quite wide application. This hardening process may also be of special value in the future utilization of some oils like the fish oils, which, because of objectionable flavors and odors, are not entirely suited for edible purposes in their natural state.

NUT BUTTERS.

Closely related to the nut oils mentioned above (see p. 13) are the nut butters prepared by grinding finely the meats of peanuts, almonds, or other nuts rich in fat, so as to produce an oily mass much like butter in consistency. Peanut butter is by far the most common of the nut butters. It is used chiefly as a filling for sandwiches, crackers, etc., though it finds some use in cooking. The nut butters can be made at home by grinding the whole nuts; a special nut-butter knife being furnished with some of the meat or food choppers. In addition to containing a large amount of fat, nut butters also contain considerable protein.

AVOCADO.

Although its oil is not extracted for food purposes, the avocado, commonly called the alligator pear, a tropical fruit which is becoming better known in some of our markets, contains as high as 20 per cent of fat in the edible portion. When used in the diet this must be taken into consideration as a source of fat.

THE SELECTION OF EDIBLE FATS.

In the selection of edible fats the principal considerations should be the purpose for which the fat is to be used, quality, price, and individual preference, since the energy which the body derives from different fats is about the same, and all are regarded as wholesome when of good quality. Custom, which influences to a considerable extent the choice of all foods, can, therefore, be subordinated to the more essential consideration of economy.

When purchasing fats for table use it should be remembered that they influence the wholesomeness of the foods with which they are served as well as the energy value and cost. The price of table fats depends largely upon their flavor and to a less extent on color, and in selecting them each housekeeper must decide how much she can afford to pay for these properties, since all the edible fats have practically the same energy value. In general it pays always to buy fats of such good quality that none will have to be thrown away through spoilage. In some instances a higher-priced article may be more economical in the end as, for example, clean, sanitary butter, as compared to a cheaper but less sanitary product. In some instances, where taste or flavor only is involved, a less expensive table fat may answer quite satisfactorily the purpose of a more expensive one. For example, the chief use of table oils is as an ingredient of salad dressings, and when a characteristic flavor is not especially desired, good grades of cottonseed and peanut oils, having a bland flavor, may be used, when these are less expensive than the corresponding grades of olive oil.

Fats used for shortening influence the appearance, flavor, texture, composition, keeping quality, and cost of the foods in which they are incorporated. In selecting shortening fats flavor and odor are to be considered, but attractive appearance and color are of less importance, since in cooking these are usually masked. Other qualities being equal, those culinary fats are more economical and desirable which possess the best keeping quality; that is, the least tendency to become rancid. Also, for general use shortening fats give the best results if they are neither too hard nor too soft to be easily mixed with the other ingredients of the dough at ordinary temperatures.

Fats used as a medium for cooking should be carefully selected, since they influence the flavor, appearance, and texture of the foods cooked in them, as is evident when one recalls the bad flavor imparted to fried foods by burned or rancid fat. Preference should be given to a fat which does not scorch too readily at the temperature most commonly used for frying. Experiments in the laboratory of the Office of Home Economics indicate that butter and lard scorch at a lower temperature than beef or mutton fats and cottonseed, peanut, or coconut oils. For this reason, therefore, the latter fats are preferable for deep frying, which requires high temperature.

Prejudice often exerts an influence on the selection of fats as well as other food materials, and these prejudices are often curious. For example, some persons who think that lard is not only indigestible, but also unwholesome, nevertheless enjoy bacon, which, of course, supplies pork fat in a different form. Such prejudices have little

or no basis of fact and should not exert too much influence on the selection of any food material.

ECONOMY IN THE USE OF FATS.

In minor details the practice of economy in the use of fats must vary according to conditions in different homes, and each housekeeper must determine for herself the manner in which economy may be secured in her own household. There are some general suggestions, however, which are worth consideration.

Economy in the use of table fats probably may best be secured by avoiding careless or needless uses. The quantities of butter, salad dressing, or table oils generally eaten by the different members of the family should be observed, and the size of the portions served governed accordingly, so that the left-overs will be small. One should serve all of these that a person will use, but no more. In some homes this possible economy is not considered sufficiently important to warrant the effort. In hotels and restaurants, however, where profit is increased by the prevention of unnecessary waste, this matter is given considerable attention, and careful observations have been made to determine the average quantity of butter eaten per person. It has been found that if too small a portion is served more second orders are called for, and much butter is thus wasted, because the total will so often exceed the person's desire for it. On the other hand, if the portions served are too large, a considerable quantity will be unused. As a result of such observations many hotels and restaurants have regulated the size of portions so as to give satisfaction and yet insure the smallest amount of waste. A common size is a block $1\frac{1}{4}$ inches by $1\frac{1}{4}$ inches by $\frac{1}{2}$ inch (weighing about one-half ounce), which is readily obtained by cutting a pound print of butter into 32 pieces with a cutter designed for the purpose, or with a sharp knife slightly warmed. Many housekeepers prefer to make the butter into "butterballs," using for the purpose the wooden paddles which may be bought from house-furnishing stores. The size of the balls can be regulated according to the needs of the individual.

Where table fats (chiefly butter and cream) are used in cookery to give flavor, economy demands that they be so used as to secure the maximum of quality in texture or flavor from a minimum quantity of fat. It is a waste to use more than a good recipe calls for. It is well known that too much butter makes a cake soggy, while a salad dressing with too much oil tastes "fat." It is more economical to stir butter into cooked vegetables just before they are served rather than while cooking, and the flavor thus imparted is more pronounced. Furthermore, if added before cooking

much of the butter is lost unless the water in which the vegetables are boiled is served with them. Instead of adding butter to vegetables many people cook fat ham, bacon, or salt pork with them and relish the characteristic flavor thus imparted. As another example of the economical use of butter in cookery may be cited the frying (sautéing) of eggs, rice cakes, etc., in a mixture of butter, to contribute flavor, and some such fat as lard or drippings to give a sufficient quantity of fat for the cooking process. Also, part butter (or cream) and part lard is frequently used in shortening pie crust, biscuits, etc. A mixture of equal parts of carefully rendered beef suet, lard, and butter, known as "butterschmaltz," is used in some regions of the country for shortening purposes in place of table butter.

Since shortening fats are used to secure texture more often than for their distinctive flavor, it is possible to utilize a greater variety of fats for this purpose than for table use. Oftentimes a home-rendered fat may be economically substituted for butter, lard, or vegetable fats for shortening purposes. For instance, beef-brisket fat is softer than suet and, if well rendered, can be used to make gingerbread, spice cake, and similar dishes in which the spice or molasses used masks the flavor of the fat. A possible economy, more common some years ago than now, is the use of chopped, unrendered suet for shortening in such foods as suet puddings, or the use of finely chopped salt pork for a similar purpose in some spice cakes. Occasionally cheese can be used both as a shortening and to give flavor, as in making Brown Betty, cheese biscuits, etc., as is mentioned in another bulletin of the Department.[1]

The use of too much fat for shortening is not only extravagant but may be unhealthy, because the frequent ingestion of large quantities of very fat foods often produces digestive disturbances. All that a dish requires to be of standard quality should be used, but no more. It is just as possible for food to be overfat or overshort as it is to be oversweet, and in the preparation of cakes, batters, etc., recipes which call for an unusually large quantity of fat should be avoided for the sake of health as well as economy. Another possible economy is the selection of a food which requires little or no fat in its preparation in place of a similar kind of food rich in it, when some other ingredient of the meal supplies a generous amount of fat. For instance, sponge cake instead of pound cake, or beaten biscuit instead of butter cakes, might well be selected when very fat meats or other fat dishes form a part of the meal.

In frying, fat serves principally as a medium for transmitting the heat needed for cooking. The flavor is modified also, as is evident

[1] U. S. Dept. Agr., Farmers' Bul. 487.

from the fact that foods like croquettes when fried in fat have a different taste from those baked in the oven. Since all foods in frying absorb some fat, their nutritive (energy) value is increased. Up to a certain point this may be an advantage, but it is desirable to regulate the amount absorbed in order that the foods may be of good flavor and texture and not overfat. An excess of fat soaked up by the food is not only waste, but lowers the quality and may give rise to digestive disturbances in the case of some persons.

The temperature of the fat during deep frying has considerable influence upon the quantity of fat which the food absorbs, and some preliminary studies have been made in the laboratory of the Office of Home Economics to determine satisfactory temperatures. A doughnut batter was prepared from flour, egg, milk, sugar, and baking powder, and portions of uniform size and shape were fried for definite periods of time in beef fat, lard, cottonseed oil, coconut fat, and peanut oil at a number of different temperatures. It was found that there was a definite temperature for each fat at which the batter soaked the smallest quantity of fat and was most satisfactorily cooked as regards texture. This temperature was about 360° F. for beef fat, 350° F. for lard, and 390° F. for cottonseed, coconut, and peanut oils. Subsequent chemical analyses of the doughnuts showed that if this temperature were lowered 20° F. for the animal fats and 40° F. for the vegetable fats the quantity of fat absorbed by the doughnuts was increased approximately 25 per cent. Although these temperatures may vary somewhat with different lots of fat, owing to slight variations in composition, it may be stated in the light of these experiments that for successful deep frying vegetable fats should be heated from 30° to 40° F. higher than animal fats. Mixtures of beef or mutton fats with some of the oils and softer fats were also tested. With mixtures of equal amounts of hard and soft fats the optimum temperature was midway between that of the two separate fats. There is less danger of a fat being too hot than being too cold for frying foods, since a tendency for the food to burn is more easily noted by the cook than a tendency for it to soak fat. Also, if the fat is too cool more of it is absorbed by the foods. However, fats used for deep frying should never be heated high enough to scorch, as the burned flavor and odor are very hard to remove, and foods fried in scorched fats are of poor quality. A thermometer which will register as high as 420° F. is very useful for measuring temperatures in deep frying, but it is rather expensive, and a fairly close idea of the temperature may be obtained by noting the time taken to brown a 1-inch cube of bread completely immersed in the hot fat. Experiments in the laboratory of the Office of Home Economics indicate that vegetable fats are at the most satisfactory

temperature for deep frying when the bread is cooked to a golden-brown color in one-half minute or is well browned in one minute. Lard, beef, and, probably, mutton fats are hot enough when the bread is cooked to a golden-brown color in one minute or is well browned in one and one-half minutes.

In sautéing, or pan frying, the food is cooked on a layer of fat rather than completely immersed in it, as in deep frying, and for this reason there is less opportunity for the food to soak fat. There is more danger, however, that the food so cooked will be burned unless care is taken, since the pan may become too hot and the relatively small amount of fat may soon be used up and the food stick to the pan. For this reason a fat which does not scorch at a low temperature is especially desirable for sautéing; butter, for example, being less satisfactory in this respect than lard or beef fat. If the butter flavor is desired in pan-fried foods, a little butter can be used with a harder fat or the butter can be added after cooking. Otherwise great care must be exercised to avoid scorching.

UTILIZATION OF WASTE FATS.

In many homes the failure to utilize left-over or discarded portions constitutes the chief waste of fat. Many housekeepers who are economical in other ways do not give sufficient attention to this matter, and, as a result, there is apt to be more fat wasted than either protein or carbohydrate. In cities this is evidenced by the fact that there are large and profitably conducted concerns whose only business is the recovery and sale of grease from garbage. As this grease is always sold for soap making or other industrial purposes, it is not a complete loss, though lost to the housekeeper, and much of it, if properly saved in the home instead of thrown in the garbage, might have been used for culinary purposes. In country households there is often better opportunity for utilizing waste fats than in the city, and it is quite possible that some of the fat ordinarily fed to the pigs and chickens might be more economically utilized if the edible portions were carefully rendered and used for cooking purposes and the remainder used for soap making. The latter is not such a difficult process as many persons suppose. The necessary lye may be readily purchased at a low price, and simple directions for soap making usually come with it.

From the standpoint of economy it is desirable for the purchaser of meat to secure all the fat which he pays for in a particular cut. The dealer pays a flat rate per pound for the carcass, which includes the lean meat, fat, and bone. The fat must either be sold with the meat or else removed and the lean meat sold at a higher price to insure a profit. Many butchers in preparing beef, mutton, or poul-

try for delivery remove much of the fat in order to make the meat appear more attractive. The purchaser often does not take the trouble to ask for this fat, even though he may have paid for it at the same rate as the meat. If this fat were secured, as is frequently the case with the excess bone and trimmings which are used for soup making, it could often be rendered at home and used to supplement cooking fats. Sometimes very large and fat cuts of meat are sold at a relatively low price per pound. While the purchaser may think that thus a bargain is being secured, it is usually true after allowance has been made for a large quantity of fat and bone that the price paid for the lean portion is considerably higher than appears at first thought. In such cases it is especially desirable that the excess fat be utilized in the home.

If one so desires, bits of fat meat, portions of butter, etc., left over from the table may be saved, rendered (if necessary), clarified, and used for cooking. While there may seem to be some esthetic objection to this procedure, this is not necessarily a serious one under family conditions where good health prevails, since if properly rendered the fat is sterilized. The better way, however, is to effect the same saving by taking care in serving that each portion is approximately what will be eaten. Under commercial conditions the use of table left-overs is entirely unjustified, since the person served can know neither the circumstances under which they were obtained nor the quality of the material which he may eat. The pieces of excess fat trimmed before cooking from roasts, steaks, or chops should be saved as well as the drippings tried out in cooking. Drippings from fresh pork may be clarified and used like lard. Beef fat or drippings and small quantities of lamb fat, if fresh and carefully clarified, may be added to lard or other soft fats for deep frying. Sausage, ham, and bacon fats may be used as they are for frying and warming up foods, since the characteristic flavors which they impart are relished by many.

In some parts of the country fat is used (but less now than formerly) to preserve meats for a limited time. The thoroughly cooked meats are placed in clean earthen jars or wooden tubs, and over them is poured a sufficient quantity of hot melted lard or beef suet to cover. The hot fat sterilizes the surface of the meat and on cooling forms a protective coating against the action of the air, bacteria, or mold spores. So far as is known this method has not been tested experimentally, but meat so treated is said to keep very well, providing it is thoroughly cooked and the fat has been heated sufficiently to sterilize it and drive off the water. To prevent the fat from becoming rancid it is desirable to store the jars in a cool, dark place. Carefully rendered beef suet or mutton tallow may also be

used in the place of paraffin, which it closely resembles in consistency, to seal the tops of jelly glasses. To cite another instance, a spoonful of salad oil may be poured on top of the liquid in an opened bottle of pickles or olives. This excludes air and so helps to keep the material in good condition until used.

RENDERING AND CLARIFYING FATS.

Beef or mutton suet and scraps of fat contain more or less muscle or connective tissue, which must be removed by rendering before the fat is available for most culinary uses. The household method of rendering generally consists in cutting the material into small pieces and heating it in an open kettle until the fat has separated out quite completely from the particles of tissue, which usually have become shriveled and browned. This tissue (called "scraps" or "cracklings") is then removed by straining, being pressed to remove the fat more completely. The scraps or cracklings are utilized in various ways in different parts of the country, being sometimes eaten as such and sometimes used as shortening. Some housekeepers prefer to render their fat with the addition of water, since they believe there is less danger of burning. However, this necessitates heating the strained fat until the water is driven off to secure a fat of good keeping quality.

The following method of rendering fats, found to be very satisfactory in the laboratory of the Office of Home Economics, may be applied in the home. The fat is cut finely with an ordinary household meat chopper or sausage grinder and is then heated in a double boiler until completely melted. The melted fat is then strained through a rather thick cloth (medium fine huckaback, for instance) to remove the finely divided bits of tissue. The advantage of this method is that since the material to be rendered is finely divided the fat separates readily from the inclosing tissue at a temperature very little above its melting point, and there is no danger of scorching it as in the older open-kettle method. This is of importance, since recent information shows that fats overheated in rendering do not keep as well as those which have not been heated too high. Also, there is no odor of scorched fat in the room during rendering. After the fat is rendered it should be carefully heated to make sure that it is free from moisture, and sterilized. This method of rendering fat is entirely satisfactory when the quantity of fat to be rendered is fairly small. The difficulty of using it on a large scale would depend chiefly upon the labor and cost of grinding the fat, for if a double boiler of sufficient size were not available one could be improvised by setting the kettle containing the fat in a larger kettle containing water. Pieces of wood or other material should be placed

on the bottom of the outer kettle to insure a layer of water between the two kettles and prevent the fat from becoming too hot.

Fats which have been saved when meats are cooked, or which have been salvaged in some other way, must usually be clarified—that is, freed from objectionable odors, tastes, or colors—before being entirely satisfactory for culinary purposes. A common custom is to cook a slice of potato in the fat, and this may help if the fat is fairly satisfactory to start with. A fairly successful household method for clarifying fats is as follows: Melt the fat with at least an equal volume of water and heat for a short time at a moderate temperature, with occasional stirring. Let the mixture cool, remove the layer of fat, and scrape off any bits of meat and other material which may adhere to the under side. Rendering or clarifying fat with milk gives quite satisfactory results in modifying odors and flavors. The procedure is as follows: To 2 pounds of fat (finely chopped if unrendered) add one-half pint of milk (preferably sour). Heat the mixture in a double boiler until rendered or thoroughly melted, stir well, and strain through fairly thick cloth. When cold the fat forms a hard, clean layer, and any dark material adhering to the under side of the fat may be scraped off. Sour milk, being coagulated, is preferable to sweet milk, since the curd remains on the cloth through which the rendered mixture is strained and is thus more easily separated from the rendered fat, which has acquired some of the milk flavor and butter fat.

Undesirable odors and flavors can be decreased in intensity or removed, if not too pronounced, by heating the fats with a good grade of charcoal, and the method is applicable to fats which could not be satisfactorily treated by the method first spoken of. To each pound of chopped, unrendered fat add 12 pieces of clean, hardwood charcoal about the size of a walnut and render the fat in a double boiler, as described above. Allow the charcoal to remain in the melted fat for about two hours and stir the mixture occasionally. It is necessary to strain the fat through flannel or other closely woven cloth to remove all the fine particles of charcoal. Rancid odors, if not too pronounced, may be satisfactorily removed by this method. If the odor is very pronounced more charcoal is needed, and the mixture requires longer heating. It is interesting to note that the characteristic yellow color of the beef fat may be removed and a white, odorless fat secured.

SAVORY FATS.

Savory fats—that is, fats to which have been added some strong seasoning material, such as sage, marjoram, summer savory, or thyme—offer a satisfactory method of utilizing fats having pro-

nounced odors or flavors like those of beef or mutton. The specific flavoring bodies present in these seasoning materials are dissolved in the fats and mask the strong original flavors. Savory fats are useful for frying, warming up vegetables, etc., since they impart a distinct flavor to foods.

There are a number of recipes for the preparation of savory fats. The following have been tested and found to be satisfactory with mutton or beef fats:

SAVORY FAT, I.

To 1 pound of unrendered fat (chopped fine) add 1 slice of onion about ½ inch thick and 2 inches in diameter, 1 teaspoon broken bay leaves, 1 teaspoon salt, and about ⅛ teaspoon pepper. Render in a double boiler and strain.

SAVORY FAT, II.

To 1 pound unrendered fat (chopped fine) add 2 teaspoons thyme, 1 slice onion about ½ inch thick and 2 inches in diameter, 1 teaspoon salt, and about ⅛ teaspoon pepper. Render in a double boiler and strain.

SAVORY FAT, III.

To 1 pound unrendered fat (chopped fine) add 1 teaspoon thyme, 1 teaspoon marjoram, ½ teaspoon rubbed sage, 1 teaspoon salt, and about ⅛ teaspoon pepper. Render in double boiler and strain through fine cloth.

If it is desired to prepare a savory fat from a rendered fat the above recipes may be modified by melting the fat, adding the seasoning in the same proportion as above, heating the mixture gently for an hour or more, and straining. The following recipe has also been recommended for preparing a savory fat from a rendered fat:[1]

To 1 pound rendered fat (melted) add 1 sour apple, 1 onion, and 1 teaspoon ground thyme or other sweet herbs tied in a small cloth. Cook together in oven or on the back of the stove until the onion and apple are well browned. Strain the fat through a fine cloth.

The kind and amount of seasoning recommended may be easily modified to suit one's taste. Potato chips and French fried potatoes cooked in each of the above fats were found to have no noticeable mutton or beef flavor. In order to remove all particles of the herbs added it is necessary to strain the savory fats through flannel or other closely woven cloth.

SOFTENING HARD FATS TO MAKE THEM MORE SATISFACTORY FOR SHORTENING PURPOSES.

Fats, like beef or mutton suet, which are too hard for satisfactory use in shortening, may be softened to the desired consistency by mixing softer fats like lard or cottonseed oil with them. The follow-

[1] U. S. Dept. Agr., Farmers' Bul. 526 (1915), p. 9.

ing recipes have been found to be satisfactory in preparing a soft culinary fat from these hard fats:

SOFT FAT, I.

Grind together two parts unrendered beef or mutton fat and one part lard. Render in double boiler as described on page 22.

This fat is improved by adding ½ pint of milk to each 2 pounds of the mixture before rendering. The flavor is thus improved, and the fat may be used for frying or shortening.

SOFT FAT, II.

Mix three parts unrendered beef or mutton fat (ground fine) and one part refined cottonseed oil. Render in double boiler as described on page 22.

Rendered beef or mutton fats may be softened by adding to them the lard or cottonseed oil, heating the mixture until melted, and mixing thoroughly. It is desirable to stir these mixed fats occasionally while cooling to avoid the danger of the hard fat separating out. The beef and mutton flavors are lessened somewhat by this softening process.

CARE AND STORAGE OF FATS IN THE HOME.

The chief precaution to be taken in storing fats is to prevent them from becoming rancid. The exact nature of the chemical changes undergone by fats when they become rancid is not definitely known. It is certain, however, that rancidity does not occur without the previous formation of free fatty acids, and for the formation of fatty acids light, heat, and air (containing oxygen) are necessary. Therefore, fats to be stored for some time should be protected from heat, light, and air. In the case of table fats like butter, which usually are not kept long in the home, it is only necessary to keep them in a cool place and away from objectionable odors and flavors, which they absorb quite readily. The common custom of keeping butter in a clean earthen dish in the ice compartment of the refrigerator is probably the most satisfactory for the average housewife. The rural custom of keeping it in a pail suspended in a deep well or on a cool and dry, clean cellar bottom is also satisfactory. Table oil, from which small quantities are used frequently, keeps best if stored in a cool place like a refrigerator and kept in small closed containers so as to exclude the air as much as possible. Bottles of dark glass, or wrapped in light-proof paper, have an advantage over clear glass bottles in that they exclude the light. Tin cans are also very satisfactory for this purpose.

More care is necessary in the storage of cooking fats than is the case with table fats, because the former are generally purchased in larger quantities and are kept longer. While it is not necessary to

seal these fats as tightly as is the case with canned fruits, they should, nevertheless, always be kept in covered receptacles and in a cool, dark place. Also, fats like lard should contain (or more accurately inclose) very little moisture, since this favors the growth of molds. In warm weather scraps of fat to be saved should be rendered promptly to prevent them from becoming rancid. In cold weather they may be kept until a sufficient quantity has accumulated to make rendering worth while.

SUMMARY.

Economy of fats in the home may be secured by intelligent selection, economical use, and by the prevention of unnecessary waste. For intelligent selection, which means choosing the fat best suited for the purpose in question, a knowledge of the properties and prices of the different fats on the market is necessary. It should be remembered that the energy value of all the pure fats is practically the same, and the housekeeper must determine how much she can afford to pay for particular flavors or appearance, on which the difference in price largely depends. To secure economy fats should be used primarily for the purposes to which they are best adapted, and the extravagant use of both table and cooking fats should be avoided. To prevent unnecessary waste fats should be carefully handled and stored so that none need be discarded through spoilage. Furthermore, all scraps of fat which accumulate in the home should be saved and used for culinary purposes wherever possible, thus lessening the amount of money expended for cooking fats. It should always be borne in mind that while an economical use of fat is to be desired, stinting is to be avoided. In determining how far economy in the use of fats is to be practiced one should bear in mind that true economy is possible only where the value of the time and energy involved in the saving or utilizing of an article is less than the value of the articles saved.

PUBLICATIONS OF UNITED STATES DEPARTMENT OF AGRICULTURE RELATING TO THE USE OF FATS IN THE HOME.

AVAILABLE FOR FREE DISTRIBUTION.

Meats: Composition and Cooking. (Farmers' Bulletin 34.)
Beans, Peas, and Other Legumes as Food. (Farmers' Bulletin 121.)
Preparation of Vegetables for the Table. (Farmers' Bulletin 256.)
Use of Milk as Food. (Farmers' Bulletin 363.)
Care of Food in the Home. (Farmers' Bulletin 375.)
Economical Use of Meat in the Home. (Farmers' Bulletin 391.)
Care of Milk and Its Use in the Home. (Farmers' Bulletin 413.)
Cheese: Economical Uses in the Diet. (Farmers' Bulletin 487.)
Mutton and Its Value in the Diet. (Farmers' Bulletin 526.)
Farm Buttermaking. (Farmers' Bulletin 541.)
Use of Corn, Kafir, and Cowpeas in the Home. (Farmers' Bulletin 559.)
Corn Meal as a Food and Ways of Using It. (Farmers' Bulletin 565.)
Production of Clean Milk. (Farmers' Bulletin 602.)
Food for Young Children. (Farmers' Bulletin 717.)

FOR SALE BY THE SUPERINTENDENT OF DOCUMENTS, GOVERNMENT PRINTING OFFICE, WASHINGTON, D. C.

Household Tests for the Detection of Oleomargarine and Renovated Butter. (Farmers' Bulletin 131.) Price, 5 cents.
Meat on the Farm: Butchering, Curing, and Keeping. (Farmers' Bulletin 183.) Price, 5 cents.
Bouillon Cubes: Their Contents and Food Value Compared with Meat Extracts and Home-made Preparations of Meats. (Department Bulletin 27.) Price, 5 cents.
Digestibility of Some Animal Fats. (Department Bulletin 310.) Price, 5 cents.
Fat Testing of Cream by Babcock Method. (Bureau of Animal Industry Bulletin 58.) Price, 5 cents.
Manufacture of Butter for Storage. (Bureau of Animal Industry Bulletin 148.) Price, 5 cents.
Normal Composition of American Creamery Butter. (Bureau of Animal Industry Bulletin 149.) Price, 5 cents.
Factors Influencing Change in Flavor in Storage Butter. (Bureau of Animal Industry Bulletin 162.) Price, 10 cents.
New Method for Determining Fat and Salt in Butter, Especially Adapted for Use in Creameries. (Bureau of Animal Industry Circular 202.) Price, 5 cents.
Detection of Phytosterol in Mixtures of Animal and Vegetable Fats. (Bureau of Animal Industry Circular 212.) Price, 5 cents.

ADDITIONAL COPIES

OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT

5 CENTS PER COPY

▽

NATIONAL AGRICULTURAL LIBRARY
1022734408